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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/578,619	05/08/2006	O'Dae Kwon	KWON3008/REF	3714
23364 7590 12/28/2007 BACON & THOMAS, PLLC 625 SLATERS LANE FOURTH FLOOR ALEXANDRIA, VA 22314			EXAMINER KING, JOSHUA	
			ART UNIT 2828	PAPER NUMBER
			MAIL DATE 12/28/2007	DELIVERY MODE PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

## Office Action Summary

Application No.

10/578,619

Applicant(s)

KWON ET AL.

Examiner

Joshua J. King

Art Unit

2828

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 01 October 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-6 and 9-11 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-6 and 9-11 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 08 May 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
  - 2) ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Response to Arguments***

1. Applicant's arguments filed October 1, 2007 have been fully considered but they are not persuasive. On pages 6 and 7 of the response to the previous office action applicants have argued that the cited references (Bae et al. and Han et al.) do not disclose or suggest a relationship between radius and power consumption. However, Bae et al. clearly shows such a relationship in Fig. 1. Fig. 1 of Bae et al. discusses the threshold current for lasing in relation to device diameter. The curve clearly shows decreased threshold current as the diameter of the device is decreased. As is commonly understood in the art, by reducing the threshold current or resistance of a device it is possible to reduce the power consumed. The examiner notes claims 7, 8, 12 and 13 have been cancelled.

### ***Priority***

2. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

### ***Information Disclosure Statement***

3. The information disclosure statement (IDS) submitted on May 08, 2006 was filed on the mailing date of the instant application. The submission is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

### ***Claim Rejections - 35 USC § 112***

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

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The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claims 1-6 and 9-11 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Applicants have amended claim 1 and 9 to say, "A method for using a three dimensional photonic quantum ring laser as a low power consumption display comprising the step of: adjusting a radius of the PQR laser...". After careful review of the specification the examiner has not found any passage which enables changing the radius of the laser during use. Applicants have cited page 12 lines 1-2 of the original specification which reads "reducing the radius R of the PQR laser can achieve adjustment of the oscillation mode wavelength and the IMS of the PQR". Applicant defines the radius of the PQR laser during an etching step as found on page 4 of the original specification.

6. Claims 1-6 and 9-11 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Please see the description above. The same argument applied to the enablement requirement can be applied to the new matter requirement.

7. **In view of the 112 1st paragraph issues, the examiner has based the rejection as he best understands the claims.**

***Claim Rejections - 35 USC § 103***

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 1-6 and 9-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bae et al. (Photonic Quantum Corral, Carrier Ordering, and Photonic Quantum Dot/Ring Device) in view of Han et al. (InGaAs-AlGaAs-GaAs Strained-Layer Quantum-Well Heterostructure Circular Ring Lasers).

10. **With respect to claims 1 and 9**, Bae et al. discloses adjusting a radius of the PQR laser to decrease the power consumption (Fig. 1), the PQR laser oscillating at multiple wavelengths in a wavelength range within a gain profile of a given semiconductor material (Fig. 4). Bae et al. does not explicitly disclose the dependence of modal spacing on the radius of the ring lasers. However, Han et al. discloses adjusting the radius of the ring lasers to adjust the modal spacing (817 introduction lines 12-18). The advantage is that by adjusting the radius the device can be optimized to emit at a pre-selected number of modes or a single mode (817 introduction lines 12-18).

11. **With respect to claim 2**, Han et al. further discloses increasing the IMS causes the oscillation modes oscillating in the envelope to be decreased (817 introduction lines 12-18).

12. **With respect to claims 3 and 10**, Bae et al. further discloses wherein the radius of the PQR laser is in a range of 15  $\mu\text{m}$  to 2  $\mu\text{m}$  depending on the structure and shape of the PQR laser and the semiconductor material (Fig. 6).

13. **With respect to claims 4 and 11**, Han et al. further discloses wherein the radius of the PQR laser is about 3  $\mu\text{m}$  (817 introduction lines 12-18). It has already been established that the radius is adjusted to determine the modal spacing. Therefor, one of ordinary skill in the art would know to make the radius 3  $\mu\text{m}$  to optimize the modal spacing.

14. **With respect to claims 5 and 6**, Han et al. further discloses wherein the number of the oscillation modes of the PQR laser is has a value of 1 (817 Introduction lines 12-18).

15. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the device disclosed by Bae et al. with adjusting the modal spacing by adjusting the radius as disclosed by Han et al. in order to optimize the device to emit at a pre-selected number of modes.

### ***Conclusion***

16. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Kwon et al. (U.S. Pre-Grant Publication 2002/0024980) discloses a PQR laser. Furukawa (U.S. patent Number 6,282,226) discloses a 3D ring laser. McCall (U.S. Patent Number 5,343,490) discloses a whispering mode micro-resonator. Park et al. (Chiral wave propagation manifold of the photonic quantum-ring laser) discloses inter-mode spacing dependent on radius. Armani et al. (Ultra-high-Q toroid

microcavity on a chip) discloses a ring laser. Bae et al. (Spectrum of three-dimensional photonic quantum-ring microdisk cavities: comparison between theory and experiment) discloses a PQR laser and its properties. Park et al. (Evanescent and propagating wave characteristics of the photonic quantum ring laser) discloses a PQR laser and its properties.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Joshua J. King whose telephone number is 571-270-1441. The examiner can normally be reached on Mon.-Thurs. 10:00-7:30 and other Fri. 10:00-6:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Min Sun Harvey can be reached on 571-272-1835. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA-OR CANADA) or 571-272-1000.

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JJK 12/18/2007

